Michael Garabedian
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08/16/2011 04:44 PM

To Penny_Woods@blm.gov, nvgwprojects@blm.gov
cc alan@cedarstrat.com
bcc
Subject Petroleum formations and groundwater project geologic mapping DEIS issues

To:

Clark, Lincoln and White Pine Counties Groundwater Development Project
Penny Woods, Project Manager

Penny,

Last week in a conversation at a DEIS meeting I erroneously stated to Patrick Plumley and other AECOM individuals present that Water Keepers submitted groundwater EIS scoping scoping comments based on the work of Alan Chamberlain from Eureka, about the related matters of inadequacy of project area geologic mapping and hydrocarbon pollution of project groundwater. Water Keepers has addressed comments about this to others, such as to the Nevada Legislative Committee on Public Lands, but our group was not actually created until after the scoping meetings.

Du□ring the conversation last week, I referred AECOM to the Cedar Strat website,
http://www.cedarstrat.com/nevada.php
http://www.cedarstrat.com/
which is Mr, Chamberlain's website, and I referred them specifically to his presentation there titled, "Dr. Chamberlain's Great Basin Geologic Presentation."

For EIS and related purposes, I recommend this presentation to you and others with the Bureau of Land Management's Clark, Lincoln and White Pine Counties Groundwater Development Project, and to AECOM because it raises project environmental issues, such as project water quality and the inadequacy of existing geologic mapping and knowledge for all project related purposes, including for modeling.

I have discussed Mr. Chamberlain's work with a USGS geologist working on project issues related to Great Basin National Park who is familiar with his work including his published material, who confirms the importance of his work.

A page from Mr. Chamberlain's website is copied below.

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Water Keepers, a Nevada nonprofit organization
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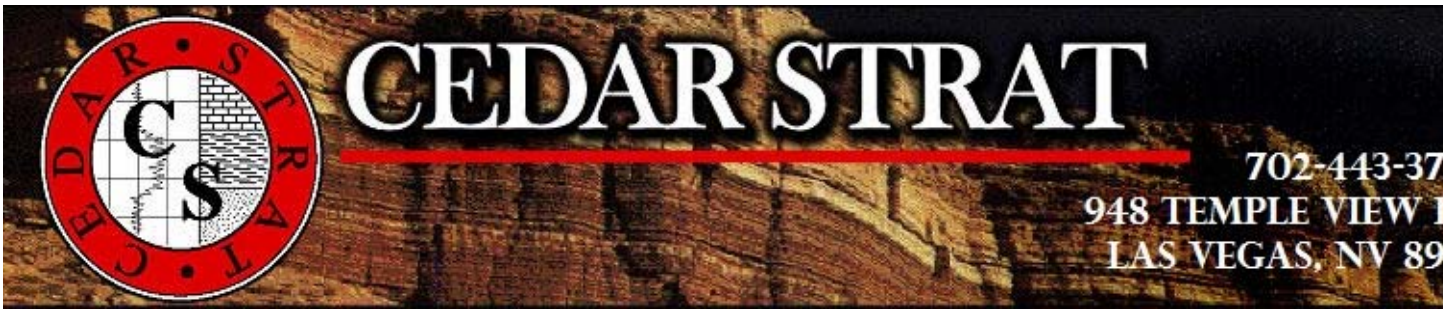
Citrus Heights CA 95621
916-719-7296



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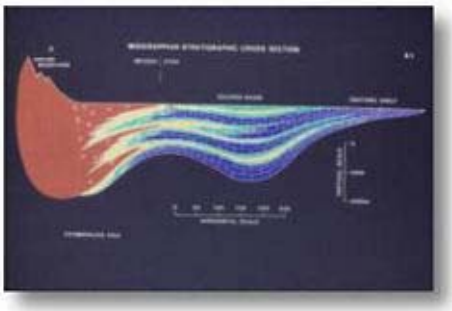
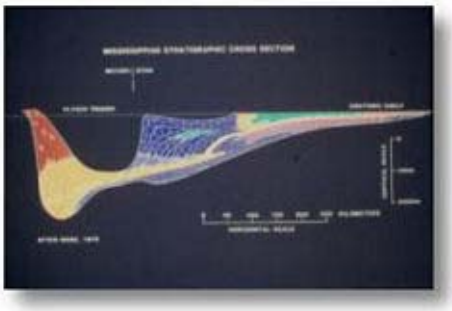
Dr. Chamberlain's Great Basin Geologic Presentation

Nevada Oil and Gas Fairway

Cedar Strat was formed to generate data for oil and gas exploration in the Great Basin, Nevada and Utah, for oil companies. While generating data, **Alan K. Chamberlain PhD** and President of Cedar Strat, began finding evidence that commonly held beliefs about the Great Basin were incorrect. The first monumental discovery was that he found the Mississippian Antler foreland basin is composed of regressive lacustrine sequences interbedded with transgressive marine sequences and not composed of deep flysch turbidites as promulgated by the USGS. Second, he learned and has substantiated that the north/south structural grain of the Eastern Great Basin was caused mostly by compression rather than extension as currently promulgated.

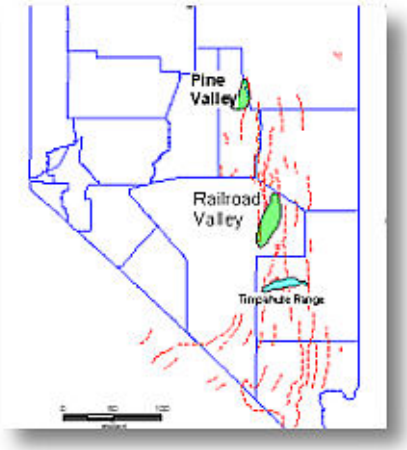




As part of Alan's Master's thesis at Brigham Young University, he developed a model of non-marine regressive sequences interbedded with marine transgressive sequences of the Western

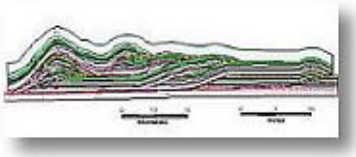
Utah portion of the Mississippian Antler Basin. The shallow water sequences were disputed by seasoned professors and the USGS who held to the deep water model. Alan, in defense of his thesis, showed his professors and the USGS unequivocal evidence of non-marine sequences with **terrestrial plants, grown in place** with roots penetrating the bedding planes. The coverage of his samples of non-marine, lacustrine flora, extends over the length and breadth of the Antler Basin. During the early Cedar Strat days, Alan directed his

geologists to take samples of any rock that looked like a source rock or reservoir rock. As the source rocks were analyzed and the locations plotted, trends in the **deposition of thousands of feet of thermally mature organically rich shales** were revealed. As the reservoir rocks were analyzed, karsted intervals associated with regional unconformities, reef trends and sandstones, brought an understanding of regional reservoir and trapping mechanisms.



The crowning piece of the puzzle came as basic geologic mapping began revealing **hundreds of miles of thrust traces**. The evidence gathered from the field lead Alan to develop thrust fault models of the Great Basin. This was culminated through his work at the Colorado School of Mines where he obtained his Doctorate in Geology, Sequence Stratigraphy. While working on his Doctorate Degree, Alan identified a stratum which has become known as the Alamo Breccia. Within a specific stratigraphic layer is the result and evidence of a meteor impact. The impact breccia contains evidence of an extra-terrestrial impact: iridium shock quartz and limestone spherules. Using the data generated around this occurrence, Alan used "snip" reconstruction methods to learn how far the depositional environment had to move to restore the breccia to it's original state. This analysis by Alan gives a powerful tool for understanding the thrusting which took place in the Great Basin.

The thrusting and folding which occurred during the **Sevier-age Cretaceous thrusting**, also responsible for the Utah-Wyoming thrust belt, pushed the rich organic material deposited in the Great Basin deep into the prime oil generating window. Palynomorph and Conodont analysis of the source rock show they are thermally mature. Additionally, Alan has measured over a million feet of stratigraphy and mapped over 300 7.5' quadrangles, giving him an understanding of his thrust models replacing the common horst and graben models purported by entities who lack data and field experience.



Armed with the data of the source rocks, reservoir rocks, thrusting and trapping structures, Alan correlated the data to develop what Cedar Strat refers to as the **Nevada Oil and Gas Fairway**. It is noteworthy that all 50+ million barrels of oil generated in Nevada to date, have been generated along this Nevada Oil and Gas Fairway.

If you desire additional understanding of these concepts and data, Cedar Strat has a presentation and/or field trip which we would be pleased to share with you.

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